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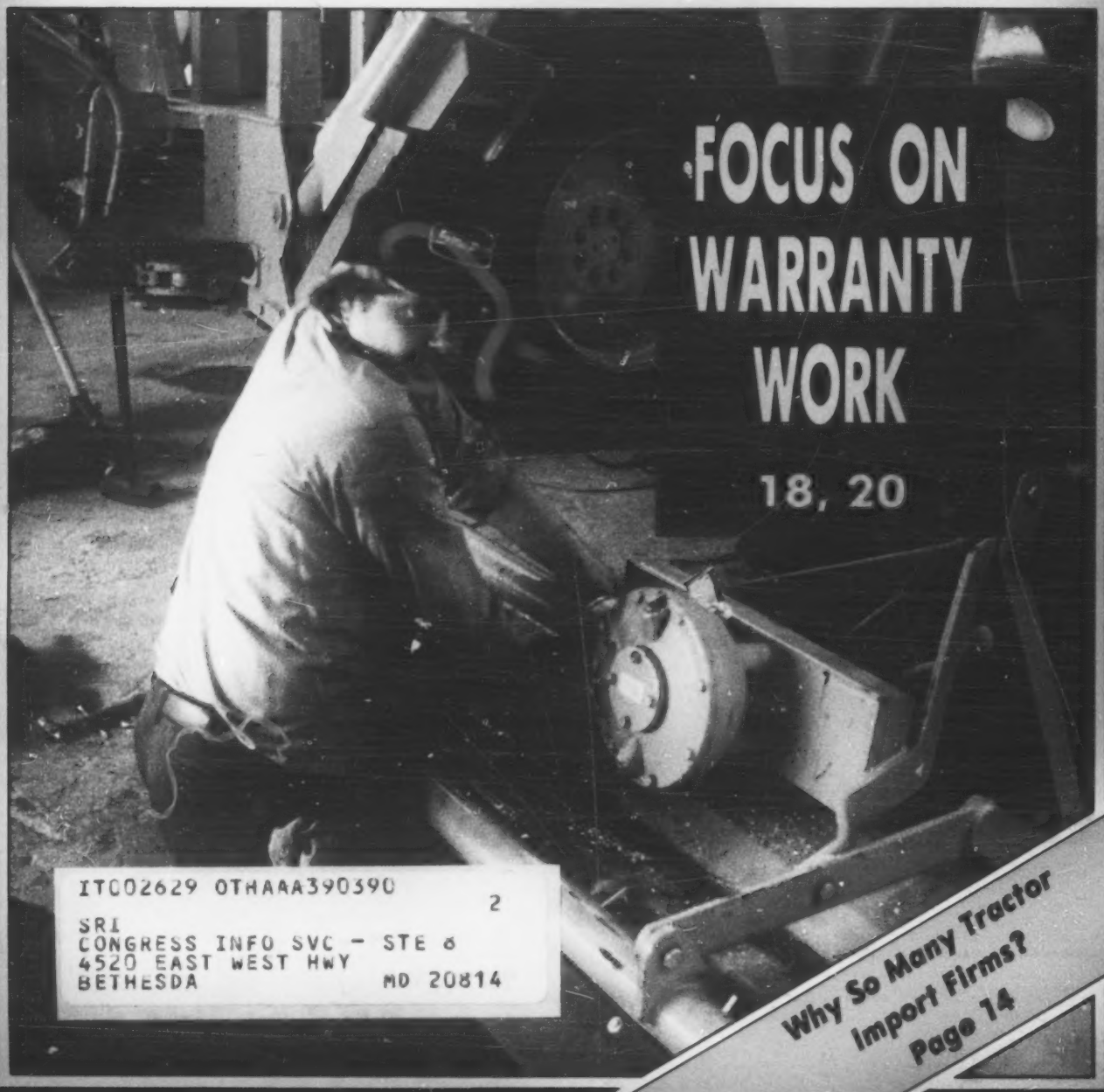
I&T 100 YEARS OF LEADERSHIP

Implement & Tractor

The business magazine of the farm and industrial equipment industry

April 1989

Where Horsepower Sold in 1988 page 12



FOCUS ON WARRANTY WORK

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Why So Many Tractor Import Firms? Page 14

I&T 100 YEARS OF LEADERSHIP

Implement & Tractor

The business magazine of the farm and industrial equipment industry.

April 1989 • Vol. 104 • No. 5

On Our Cover

Two articles explore the issue of extended warranty and its impact on dealers.

(Photo taken by Glenn S. Hensley at Sharp Ford Tractor Co., St. Louis, Mo.)

18, 20

12: **Tractor Sales:** State-by-state breakdown of farm wheel tractor sales by horsepower categories.

14: **Imports, Part III:** The softened dollar was supposed to make it tougher for imported farm tractors. For some, it has. For others, it has opened a window of opportunity.

18: **Warranty Costs:** An I&T survey indicates many dealers are fuzzy on the subject. Bottom line: Warranty costs to dealers will become a stickier issue.

19: **Dealers Comment:** Dealers voice their ideas about warranty costs.

20: **Warranty Losses:** What can be done? Is it anybody's fault? Is it everybody's? A pro offers suggestions for both parties.

22: **Fuel Efficiency:** An update of I&T's 1982 study. Which of the 180 models tested at Nebraska 1982-86 fared best—and worst?

24: **Dealers of** the '90s: Shortline marketer sees a multi-franchise world. Do you like the idea? Do you agree?

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Retail Sales: Big Tractors Up, Small Units Down

Sales of big tractors (two-wheelers over 100 hp and all four-wheelers) were up strongly in February and for the year to date. But tractors under 40 hp, mostly from Japan, were off substantially.

UNIT RETAIL SALES

Equipment	February 1989	February 1988	% Change	January-February 1989	January-February 1988	% Change
Farm Wheel Tractors:						
2-Wheel Drive						
Under 40 HP	2,210	2,614	(15.5)	4,440	5,749	(22.8)
40 & Under 100 HP	2,151	2,182	(1.4)	4,238	4,559	(5.1)
100 & Under 140 HP	323	240	34.6	738	750	(1.6)
140 HP & Over	1,022	585	74.7	23,310	1,832	26.1
Total 2-Wheel Drive	5,706	5,621	1.5	11,816	12,890	(8.3)
4-Wheel Drive						
Under 200 HP	92	46	100.0	191	112	70.5
200 HP & Over	197	99	99.0	362	213	70.0
Total 4-Wheel Drive	289	145	99.3	553	325	70.2
Total Farm Wheel Tractors	5,995	5,766	4.0	12,369	13,215	(6.4)
Combines (Self-Propelled)	196	220	(10.9)	561	822	(31.8)
Balers (Bales under 200 lbs)	260	169	53.8	558	357	56.3
Forage Harvesters (Shear Bar Type)	81	87	(6.9)	166	150	10.7
Mower Conditioners	476	365	30.4	904	654	38.2

1988 Exports, Imports: Strong Volume Increases

Exports and imports of farm equipment in 1988 were up strongly over 1987 activity, according to the U.S. Dept. of Commerce. Export volume rose by 21.2 percent to $1.911 billion; imports went up 20.5 percent to 2.207 million. It was an all-time high for imports; exports peaked in 1984 at $2.23 billion, then fell to $1.47 billion in 1986.

U.S. farm equipment was exported to over 170 nations in 1988. Principal customers were Canada ($585 million, down 9 percent), Saudi Arabia ($128 million, up 12 percent), France ($129 million, up 34 percent), Australia ($122 million, up 148 percent), Mexico ($122 million, up 79 percent), Britain ($98 million, up 57 percent), Belgium ($82 million), West Germany ($76 million, up 38 percent) and Venezuela ($63 million, up 9 percent).

Major sources of farm equipment imports to the U.S. were: Canada ($576 million, up 15 percent), Japan ($389 million, down 7 percent), Britain ($366 million, up 44 percent), West Germany ($290 million, up 18 percent), Italy ($155 million, up 20 percent), and France ($119 million, up 85 percent). Farm equipment was imported from 70 nations in 1988.

Deere's 1st Quarter: Sales Hit $1.14 Billion

Deere & Co. has reported worldwide net sales to dealers of $1.141 billion in the first quarter of 1989, ended Jan. 31, an increase of 9 percent from 1988.

Earnings were $48.4 million compared with $67.5 million in the same 1988 quarter. The results reflect "significant improvement in pretax income from operations, although net income is lower because of nonrecurring gains in last year's initial quarter," in which there was a one-time gain of $28.7 million as a result of an accounting rule change, plus $9.3 million from tax-loss carryforwards.

Deere says it has raised production schedules for all products by 14 percent over actual 1988 output.

Changes...

Davis H. Morris is new president of Toro Co. He joined the company in 1979 and has been chief operating officer since July, 1988.

Husqvarna Power Products, Itasca, Ill., has changed its name to Husqvarna Forest & Garden Co. It is the North American marketing company of Sweden's Husqvarna Forest & Garden A.B.

Agfor Inc., farm equipment distributor based at Plessisville, Que., has named Luc A. Cazabon as its executive vice-president and general manager.

Snapper Power Equipment, McDonough, Ga., has given its president, Richard E. Robinson, the added duties of chief executive officer. Clifford H. Boylston, executive vice-president, takes on the added responsibilities of engineering and manufacturing operations. John Steed is new marketing services manager and David Bernhardt is advertising manager.

Robert L. Vermeer and Mary V. Andringa have been named chairman of the board/CEO and president/COO, respectively, of Vermeer Mfg. Co., Pella, Ia. Earlier, they had shared the office of president with their father, Gary Vermeer, who founded the $100 million-plus company.

Big Ox, manufacturers of rear blades, box blades, V plows and other products, is now part of Heartland Products Group, Galva, Ill. Production of the line is now based at Galva. New products currently being introduced include rotary cutters, estate mowers, tillers, pulverizers and rollover box blades.

ZF of North America, Lincolnshire, Ill., has leased a 57,700-sq.-ft. building at Vernon Hills, Ill., to house service facilities and related office space for its Automotive and Off-Highway Divs.

1988 FARM WHEEL TRACTOR UNIT SALES

SALES FIGURES IN UNITS BY HORSEPOWER CATEGORIES

State	Two-Wheel Drive Tractors																	Four-Wheel Drive Tractors				Total All Farm Wheel Tractors	State
	Under 20	20 & Under 30	30 & Under 40	40 & Under 50	50 & Under 60	60 & Under 70	70 & Under 80	80 & Under 90	90 & Under 100	100 & Under 110	110 & Under 120	120 & Under 130	130 & Under 140	140 & Under 160	160 & Under 180	180 & Over	Total 2WD	Under 200	200 & Under 250	250 & Over	Total All 4 WD		
Alabama	635	734	374	358	298	146	155	113	9	21	8	17	4	53	25	9	2,959	--	2	--	2	2,961	Alabama
Alaska	6	3	1	1	--	--	--	--	--	--	--	1	--	--	--	--	12	--	--	--	--	12	Alaska
Arizona	103	79	36	40	18	35	52	91	15	22	17	18	32	52	20	47	677	1	2	5	8	685	Arizona
Arkansas	575	543	254	334	297	245	181	55	10	5	--	3	8	76	112	447	3,145	19	24	62	105	3,250	Arkansas
California	1342	1265	413	210	388	420	732	517	155	58	24	63	72	122	83	99	5,963	15	37	35	87	6,050	California
Colorado	178	142	49	38	42	42	30	17	8	8	10	15	11	60	52	48	750	44	24	30	98	848	Colorado
Connecticut	443	313	123	58	58	36	8	6	9	--	--	2	--	8	--	1	1,065	--	--	--	--	1,065	Connecticut
Delaware	102	111	26	21	33	17	25	2	3	--	3	4	1	9	7	5	369	--	7	5	12	381	Delaware
Florida	1,016	873	590	471	255	307	432	400	75	33	8	49	8	47	18	33	4,615	27	35	6	68	4,683	Florida
Georgia	937	788	583	712	393	208	276	228	42	32	9	63	32	192	73	76	4,644	2	2	1	5	4,649	Georgia
Hawaii	41	58	42	12	10	15	11	4	--	--	--	1	--	--	--	--	194	--	1	1	2	196	Hawaii
Idaho	58	48	22	14	25	34	31	18	8	8	8	11	17	58	33	97	490	7	3	13	23	513	Idaho
Illinois	792	345	114	140	237	173	173	83	33	19	25	60	105	387	183	201	3,070	68	46	59	173	3,243	Illinois
Indiana	713	453	148	101	80	137	93	69	19	22	26	29	47	188	107	118	2,348	35	21	44	100	2,448	Indiana
Iowa	221	103	30	50	60	143	162	118	67	59	51	124	161	683	278	206	2,516	59	20	32	111	2,627	Iowa
Kansas	271	143	53	50	40	105	79	52	37	42	36	74	50	306	215	225	1,778	104	108	56	268	2,046	Kansas
Kentucky	544	329	238	399	361	243	159	108	16	6	8	13	6	22	20	34	2,508	--	2	12	14	2,520	Kentucky
Louisiana	586	577	170	148	64	178	106	46	8	5	7	29	7	35	100	148	2,212	25	24	17	66	2,278	Louisiana
Maine	422	236	94	40	40	29	13	5	3	1	4	--	8	3	5	--	903	--	--	--	--	903	Maine
Maryland	832	559	199	118	97	59	49	28	7	5	11	16	10	21	7	4	2,022	1	2	--	3	2,025	Maryland
Massachusetts	424	345	104	43	48	41	20	11	4	--	1	1	--	1	--	--	1,043	2	--	--	2	1,045	Massachusetts
Michigan	982	621	216	133	200	179	117	78	27	13	22	19	20	78	44	33	2,782	32	13	11	56	2,838	Michigan
Minnesota	248	129	50	44	65	108	115	88	39	51	49	97	60	386	135	113	1,777	80	47	100	227	2,004	Minnesota
Mississippi	318	412	243	275	147	179	113	92	11	5	3	14	7	72	157	305	2,351	3	9	9	21	2,372	Mississippi
Missouri	800	443	182	270	242	290	204	161	25	64	36	51	37	227	67	169	3,268	24	24	49	97	3,365	Missouri
Montana	55	51	11	4	12	13	34	38	18	19	5	19	10	35	16	7	347	38	27	14	79	426	Montana
Nebraska	106	52	13	20	25	33	66	67	32	49	32	99	95	432	229	235	1,585	57	25	8	90	1,675	Nebraska
Nevada	32	29	5	1	5	7	5	1	2	2	--	1	--	1	--	2	87	--	1	--	1	88	Nevada
New Hampshire	431	421	129	50	32	22	13	5	2	2	1	1	1	6	1	--	1,117	1	--	--	1	1,118	New Hampshire
New Jersey	474	410	145	89	128	40	54	14	10	7	3	5	2	5	4	4	1,395	1	--	--	1	1,396	New Jersey
New Mexico	69	98	84	24	12	26	22	17	14	6	1	9	5	30	15	24	456	--	5	1	6	462	New Mexico
New York	1,373	1,008	350	260	222	187	147	157	40	17	20	35	27	66	17	13	3,937	9	3	4	16	3,953	New York
North Carolina	1,262	859	843	775	331	244	231	252	60	44	21	50	32	106	32	76	5,218	2	2	--	4	5,222	North Carolina
North Dakota	80	32	11	10	19	11	17	25	16	14	16	36	31	189	72	44	623	80	77	128	285	908	North Dakota
Ohio	1,498	684	229	230	224	203	170	108	26	26	25	40	43	141	56	55	3,758	22	6	5	33	3,791	Ohio
Oklahoma	482	324	116	104	97	91	99	85	15	22	16	31	23	133	52	38	1,729	36	64	64	164	1,893	Oklahoma
Oregon	645	303	102	82	119	73	75	71	13	11	4	18	8	52	23	13	1,612	13	7	8	28	1,640	Oregon
Pennsylvania	2,057	970	337	222	201	221	139	106	52	21	30	24	28	34	7	13	4,462	9	2	--	11	4,473	Pennsylvania
Rhode Island	50	32	12	6	1	13	--	--	1	--	--	--	--	--	--	--	115	--	--	--	--	115	Rhode Island
South Carolina	635	508	410	429	130	261	87	78	11	5	1	11	4	28	13	35	2,646	2	1	2	5	2,651	South Carolina
South Dakota	30	17	10	8	30	24	36	21	51	46	54	82	75	205	88	60	837	85	41	53	179	1,016	South Dakota
Tennessee	1,029	751	391	516	430	258	181	99	14	11	11	19	12	83	97	113	4,015	3	4	8	15	4,030	Tennessee
Texas	1,362	1,218	514	644	361	601	393	273	61	40	40	67	88	498	288	391	6,839	36	43	71	150	6,989	Texas
Utah	56	54	16	24	17	32	23	14	6	1	5	5	7	13	7	3	283	4	1	--	5	288	Utah
Vermont	241	134	53	27	39	38	24	21	10	3	4	6	3	7	1	1	612	--	--	--	--	612	Vermont
Virginia	1,065	747	536	404	353	235	162	110	19	15	4	18	12	23	6	13	3,722	1	--	1	2	3,724	Virginia
Washington	336	236	76	133	196	89	92	43	15	2	3	8	10	45	19	22	1,325	15	21	17	53	1,378	Washington
West Virginia	206	100	100	106	79	48	27	8	3	2	3	1	1	1	--	--	685	--	--	--	--	685	West Virginia
Wisconsin	305	199	62	70	150	182	202	175	80	40	49	81	52	118	44	35	1,844	26	7	7	40	1,884	Wisconsin
Wyoming	15	7	4	2	11	11	5	9	8	2	--	4	4	16	6	1	105	10	1	1	12	117	Wyoming
U.S. Government	--	--	32	4	3	312	--	--	7	--	--	--	--	--	--	--	368	--	--	1	1	369	U.S. Government
Miscellaneous	34	249	142	71	--	18	307	14	--	--	--	--	--	--	--	--	835	--	--	--	--	635	Miscellaneous
TOTAL	26,516	19,137	9,088	8,405	6,725	6,660	5,947	4,201	1,218	888	714	1,444	1,276	5,353	2,834	3,615	104,017	998	791	940	2,729	106,746	TOTAL

NOTE: One under-20-hp tractor was sold in the District of Columbia in 1988.
DATA SOURCE: Farm & Industrial Equipment Institute. Figures do not include garden tractors, motor tillers or contractor's off-highway types. Report includes units marketed by these firms. Case International, Deere, Deutz-Allis, Ford New Holland, Hesston, Kubota, Long, Massey-Ferguson, SAME, Steiger, Versatile, White-New Idea and Yanmar. Sales reported as miscellaneous are retail sales which cannot be classified by state or as U.S. government. They include sales and dispositions that do not go through usual marketing channels such as gifts to non-profit organizations, intra-plant or company transfers, etc.

Why Doesn't Fuel Efficiency Get Better?

It's time for an update of I&T's 1982 study. Which of the 180 models tested at Nebraska from 1982 through 1986 fared best—and worst?

By FRANK BUCKINGHAM

APOLOGISTS for poor tractor fuel efficiency have some explaining to do. Their story is that the declining quality of diesel fuel is seriously reducing efficiency. But if that's so, why did 18 of the 21 most fuel-efficient tractors tested at Nebraska from 1982 through 1986 reach that level on fuel weighing less than the average of all fuel used in the 180 tests?

Why did the 20 least efficient tractors tested in those years have the supposed advantage of fuel somewhat*heavier* than the average used by all tractors?

Fuel isn't as good as it was. Does this mean there are some unknown power-producing factors in that lighter fuel? Or have the companies selling those more efficient models learned to better use lighter fuel?

Nebraska tractor sales permits may now be based on tests of the Organization for Economic Cooperation and Development or ASAE/SAE. Manufacturers may use either test from now on.

In *I&T*, March 21, 1982, our article reporting on the industry's fuel efficiency track record said: "A number of studies show that fuel consumption at 75 percent of maximum drawbar load in the Nebraska tests is a reasonable approximation of tractor fuel consumption under load in normal field work.... We've used hp-hrs/gal to put all tractors on an equal basis to show how much work each one can do on a gallon of fuel."

But some say that due to varying density, lbs/hp-hr is a more accurate indicator of fuel efficiency. So those figures were used in a second article in the July 15, 1982, *I&T*, though they showed little change in relative efficiency. The latest study focuses primarily on lbs/hp-hr in the test at 75 percent of maximum drawbar load.

Fuel weight in the 1982-86 tests varied less than 2 percent, averaging 6.984 lbs/gal.

Comparing then and now

Of the 180 models tested in the 1982-86 period, 31 were four-wheelers. Of these, 15 were among the 21 tractors with the highest fuel efficiency—14.04 to 15.98 hp-hrs/gal (0.436 to 0.497 lbs/hp-hr) at 75 percent maximum drawbar load. But nine of those fuel-efficient four-wheelers had no pto and were drawbar-tested only, thus eliminating small power losses in the pto drive.

The 180-tractor average lbs/hp-hr was down 4.3 percent from the 1979-81 test average and off 2.7 percent from the 1959-81 average. The 1982-86 two-wheel-drive average fell 0.2 percent from 1959-70—0.560 lbs/hp-hr vs. 0.559. Efficiency of the 1982-86 4WDs was about 9 percent better than in 1979-81 and about 8 percent up from 1959-70 tests.

Are we to assume that convenience features, better hydraulics, etc., consume power and fuel and that today's tractors outperform those earlier models in the field? It's probably true. But no tractor has been tested at Nebraska with the air conditioner or cab fan going. And most current tractor literature proclaims that new hydraulic systems are more efficient than earlier versions. So let's be careful about blaming hydraulics for cutting fuel efficiency.

Are the real thieves the transmission and the power train? It seems likely. Most 1982-86 manual transmission tractors had better fuel efficiency than similar powershift or shift-on-the-go models. However, two Fords with synchromesh transmissions had slightly better efficiency than the same models with manual transmissions and an equal number of gears.

AVERAGE TRACTOR

LBS/HP-HR. (Nebraska Tests,

Company (No. of models Tested)	1982-86 2WD	1982-86 4WD	1982-86 All
Allis-Chalmers (41)	0.591	—	0.591
Deutz (18)	0.523	—	0.523
All Deutz-Allis (59)	0.568	—	0.568
Belarus (5)	—	—	—
Big Bud (1)	—	—	—
Case (85)	0.535	0.503	0.532
IH (76)	0.596	—	0.596
Case IH (4)	0.552	—	0.552
All Case IH (165)	0.556	0.503	0.553
John Deere (89)	0.543	0.521	0.541
Ford (88)	0.576	—	0.576
Hesston-Fiat (31)*	0.532	—	0.532
Kubota (33)	0.547	—	0.547
Long (8)	—	—	—
Massey-Ferguson (77)	0.588	—	0.588
Same (3)	—	—	—
Steiger (36)	—	0.486	0.486
Valmet (2)	0.530	—	0.530
Versatile (15)	—	0.532	0.532
White (62)**	0.544	0.538	0.543
Yamar (4)	0.650	—	0.650
Zetor (7)	0.516	—	0.516
Average All Tractors (685)	0.560	0.508	0.551

Numbers in parentheses indicate number of tractor

Hydrostatics

Fuel efficiency of hydrostatic tractors is notoriously low, especially during constant-load operation such as Nebraska testing. But they can generally outwork mechanical transmissions under varying load conditions. However, three hydrostatic tractors tested in 1982-86 were *not* the least fuel efficient. The manual transmission MF 1040 at 9.53 hp-hrs/gal and 0.732 lbs/hp-hr was bettered by the IH 3488 Hydro with 9.73 hp-hrs/gal and 0.717 lbs/hp-hr in the 75 percent drawbar load test. Versatile's hydrostatic bi-directional 276 and 256 tractors ranked fifth and 18th from the bottom respectively.

Eight IH Hydros used 25 percent more fuel per hp-hr than non-hydro IH 2WDs in 1959-86 tests, and two 4WD Versatile hydros burned 24 percent more fuel than non-hydro Versatiles. Pulling out hydrostatic tests boosts average IH 2WD efficiency and Versatile efficiency both about 3 percent over the 28 years.

Ups and downs

Deutz-Allis overall 1959-86 average fuel use includes Allis-Chalmers tests which ran 2.7 percent more than the average for all tractors tested, and Deutz, which were 10.5 percent below the all-tractor average. However, the 1982-86 average A-C and Deutz fuel use is almost 3 percent more than the 1959-81 average for the same lines. Three 1982-86 Deutz tests now apply to Deutz-Allis models.

The **Case IH** summary includes four Case IH tests plus earlier Case tests (3.4 percent less fuel than the average for all 1959-86 tests) and IH tests (fuel use 6 percent more than average). The 1982-86 combined Case and IH average was about 2 percent better than their combined 1959-81 average. About one in eight IH tested in the 28 years was hydrostatic.

Three **Deere** models were in the 21 most efficient 1982-86 models. Deere 2WD fuel efficiency was over 10 percent better than in 1979-81; 7.7 percent better than in 1959-81. In the same periods, Deere 4WDs

(See FUEL EFFICIENCY, pg. 30)

MAKERS' FUEL EFFICIENCY

1959-1986, at 75 percent of maximum drawbar load)

1979-81 2WD	1979-81 4WD	1979-81 All	1971-78 2WD	1971-78 4WD	1971-78 All	1959-70 2WD	1959-70 4WD	1959-70 All	1959-81 2WD	1959-81 4WD	1959-81 All	1959-86 2WD	1959-86 4WD	1959-86 All	1982-86 Fuel Wt. Lbs/Gal
0.593	—	0.593	0.572	0.612	0.576	0.564	—	0.564	0.572	0.612	0.575	0.575	0.612	0.577	6.975
0.509	—	0.509	0.494	—	0.494	—	—	—	0.499	—	0.499	0.503	—	0.503	7.012
0.551	—	0.551	0.542	0.612	0.547	0.564	—	0.564	0.549	0.612	0.552	0.552	0.612	0.554	6.987
—	0.500	0.500	0.521	—	0.521	—	—	—	0.521	0.500	0.513	0.521	0.500	0.513	—
—	0.502	0.502	—	—	—	—	—	—	—	0.502	0.502	—	0.502	0.502	—
0.563	0.547	0.560	0.548	0.564	0.551	0.533	0.535	0.533	0.543	0.552	0.544	0.542	0.547	0.543	6.990
0.588	0.576	0.585	0.603	0.583	0.600	0.595	0.568	0.592	0.597	0.577	0.594	0.597	0.577	0.594	6.974
—	—	—	—	—	—	—	—	—	—	—	—	0.552	—	0.552	7.004
0.577	0.564	0.574	0.577	0.574	0.577	0.557	0.551	0.557	0.569	0.565	0.569	0.567	0.562	0.567	6.988
0.605	0.536	0.594	0.597	0.553	0.590	0.575	—	0.575	0.589	0.547	0.585	0.576	0.539	0.572	6.992
0.595	—	0.595	0.573	0.555	0.570	0.548	—	0.548	0.562	0.555	0.561	0.567	0.555	0.566	6.956
0.520	—	0.520	0.510	—	0.510	0.632	—	0.632	0.534	—	0.534	0.533	—	0.533	6.985
0.599	—	0.599	0.640	—	0.640	—	—	—	0.620	—	0.620	0.583	—	0.583	7.002
0.528	—	0.528	0.528	—	0.528	—	—	—	0.528	—	0.528	0.528	—	0.528	—
0.625	0.617	0.624	0.545	0.644	0.547	0.525	—	0.525	0.562	0.587	0.565	0.569	0.587	0.571	6.993
—	—	—	0.560	—	0.560	—	—	—	0.560	—	0.560	0.560	—	0.560	—
—	0.552	0.552	—	0.550	0.550	—	—	—	—	0.542	0.542	—	0.519	0.519	6.984
—	—	—	—	—	—	—	—	—	—	—	—	0.530	—	0.530	7.016
—	0.577	0.577	—	0.566	0.566	—	—	—	—	0.575	0.575	—	0.546	0.546	6.986
0.591	0.580	0.588	0.565	0.586	0.570	0.579	—	0.579	0.576	0.584	0.577	0.573	0.573	0.573	6.999
—	—	—	0.578	—	0.578	—	—	—	0.578	—	0.578	0.632	—	0.632	6.973
—	—	—	—	—	—	0.523	—	0.523	0.523	—	0.523	0.521	—	0.521	6.974
0.583	0.557	0.576	0.569	0.563	0.568	0.559	0.551	0.559	0.568	0.560	0.566	0.566	0.545	0.562	6.984

*tests averaged. *Includes Fiat tests before Hesston-Fiat. **Includes tests for White, Minneapolis-Moline and Oliver.*

did almost 3 and 5 percent better respectively, and overall Deere fuel use improved about 9 percent compared with 1979-81 and 7.5 percent compared with 1959-81 tests.

Ford 2WDs used 3.2 percent less fuel in 1982-86 than in 1979-81, but 2.5 percent more than they burned in 1959-81 tests. Eight of the 20 least fuel-efficient tractors in 1982-86 were Fords, all Japanese imports.

Three **Hesston** tractors were in the 21 most efficient 1982-86 models, but Hesston's average slipped slightly from 1979-81 performance levels.

Kubota efficiency improved 8.7 percent from 1979-81 to 1982-86, but the 1959-86 average of 0.583 lbs/hp-hr placed Kubota next to the bottom in company-wide fuel efficiency.

Massey-Ferguson 2WDs burned about 6 percent less fuel in 1982-86 tests than in 1979-81, but still used 4.6 percent more than in the 1959-81 tests, and 12 percent more than in 1959-70, when MF was at the top of the heap in fuel efficiency. Four 1982-86 MF tractors, three of them imports from Japan, were in the 20-least-efficient-models list.

Steiger 1982-86 fuel efficiency improved over 10 percent compared with 1959-81 and 7 percent from 1979-81. But seven of the 15 most recent Steiger tractors tested had no pto, which slightly improved efficiency along with whatever other engineering changes were made to improve performance.

Even with two hydrostatic models tested, **Versatile** tractor efficiency improved 8 percent in 1982-86 versus 1979-81 and 7.5 percent from 1959-81.

White 2WDs in 1982-86 tests used 8 and 5.6 percent less fuel than in 1979-81 and 1959-81 periods respectively. In 1982-86, its 4WD performance was 7.2 and 7.9 percent better than in 1979-81 and 1959-81 tests respectively. White figures include all 1959-86 tests of White, Oliver and Minneapolis-Moline tractors.

Yanmar had the lowest 1982-86 average efficiency. Fuel use ranged from 0.587 to 0.659 lbs/hp-hr. Yanmar tractors ranked 10th, 11th and 16th from the bottom in efficiency. But the Yanmar-built John Deere 1650 had *fifth-best* fuel efficiency—14.97 hp-hrs/gal, 0.467 lbs/hp-hr. (Deere says those tractors are built by Yanmar to Deere specifications.)

Fuel efficiency of two Zetors tested in 1982-86 was 1.3 percent better than the average for five Zetors tested in 1959-70.

HIGHEST AND LOWEST

1982-86 at Nebraska

Highest Fuel Efficiency		Lowest Fuel Efficiency	
Model	HP-Hrs/ Gal	Model	Hp-Hrs/ Gal
Steiger Panther SM325*	15.98	MF 1040	9.53
Versatile 876*	15.68	IH 3488 Hydro	9.73
Steiger Bearcat KM225*	15.28	MF 1030	9.82
Steiger Panther CM360*	15.15	A-C 6140	10.25
John Deere 1650	14.97	Versatile 276 Hydro	10.25
Steiger Bearcat KM325*	14.79	Ford 1510	10.26
Versatile 1150*	14.64	Ford 1510 (Sync)	10.27
Steiger Panther KP1400*	14.54	MF 1020	10.44
Steiger Couger III*	14.40	Ford 1710 (Sync)	10.56
Steiger Couger 1000	14.31	Yanmar 276	10.57
Steiger Cougar 1280	14.30	Yanmar 336	10.66
Steiger Panther KP1360	14.27	Ford 1710	10.76
Hesston 180-90	14.25	Ford 1910 (Sync)	10.78
JD 4050 Quad Range	14.25	Ford 1910	10.86
Hesston 80-66	14.21	MF 3505	10.90
John Deere 2755	14.19	Yanmar 226	10.93
Steiger Panther KP1325	14.15	Ford 2110	10.95
Steiger Panther CP1400*	14.12	Versatile 256 Hydro	11.07
Versatile 836	14.11	Ford 2110 (Sync)	11.11
Hesston 80-90	14.09	Kubota 4950	11.15
Versatile 936*	14.04		
Average	14.56		10.54

**No pto, drawbar test only.*
Source: Nebraska Tractor Test Reports, University of Nebraska, Lincoln, Neb.

Conclusions

Despite arguments of some experts, our earlier analysis did not show significantly better fuel efficiency for 4WDs than for 2WDs. But in the latest period, all 4WD lines did better, with average 4WD fuel use up almost 9 percent from 1979-81 tests and 9.3 percent above the 1959-81 average. Since not all 4WDs are designed for or have been tested under the same conditions, no effort was made to compare performance at reduced engine speed, where some tractors operate more efficiently and develop more power than they do at rated engine speed.

Some claim that fuel efficiency varies by size of tractor. Louis Leviticus, Nebraska Tractor Test Lab chief engineer, says, "There are quite significant differences below and above 40 hp. The efficiency stays about the same up to 90 hp, then between 95 and 120 hp we again see a loss of efficiency. From about 120 until 180 hp, the efficiency is again better and about even, and again between 280 and 220 hp the efficiency goes down."

The general pattern Leviticus describes seems to fit 1982-86 2WDs.

The 20 least efficient tractors in the 1982-86 period include 16 Japanese-built models. Is it to be assumed that Japanese tractors are less efficient than North American and European models? Not really.

In the under-50-hp class, 28 Japanese-made models used 10.3 percent more fuel per hp-hr than non-Japanese tractors in that power group. But that 62-hp Deere 1650 from Japan had the fifth-best fuel efficiency.

That's not all: 12 Japanese tractors in the 50-99 hp class used 4.2 percent less fuel than the 47 non-Japanese models of that size and averaged 16 percent less fuel than their smaller Japanese counterparts. The entire 50-99 hp class was, on average, 10 percent more efficient than the under-50 tractors. It raises some questions.

For instance, does this mean that Japanese as well as Europeans and Americans know how to build efficient small tractors—but *don't*? Do we assume that the relatively small volume of fuel burned by small tractors is unimportant? That logic fails when one 49-hp Japanese tractor can burn 3.495 gal/hr in the 75 percent maximum drawbar load test compared with 3.717 gal/hr (6 percent less) for a 75-hp tractor from the same manufacturer. Overall, the 21 most efficient tractors burned about 28 percent less fuel per hp-hr than the 20 least efficient.

Are American tractor buyers and the makers of those tractors ignoring forecasts of long-term energy shortages, as is the case with automobiles? Is it all a search for glamorous gimmicks to distinguish different models? True, most recently-added features improve operator comfort or tractor performance, but many of today's smaller tractors don't offer much more than those of three decades ago, yet burn more fuel.

Is it any wonder that 30- to 50-year-old small tractors still sell for more than their last list price? Will demand for today's tractors be that good when (and if) they reach the same age? □